REMARKS

Claims 1-4 and 6-35 are pending. Claims 1 and 23-25 are rejected under 35 U.S.C. § 102(e). Claims 2-5, 7-16 and 18-35 are rejected under 35 U.S.C. § 103(a). Claim 1 is currently amended. Claim 5 is cancelled without prejudice.

Applicants fail to find a rejection of claim 17 in the present Office Action and request clarification.

Claims 1 and 23-25 are rejected under 35 U.S.C. § 102(e) as being anticipated by Li et al. (US 2002/0119781 A1). Claim 1 is amended to include the limitations of claim 5. Claim 5 is cancelled without prejudice. Claim 1, as amended, recites "a band of frequencies divided into contiguous bands of tones; a plurality of OFDM symbols, each OFDM symbol having a plurality of tones from a respective contiguous band; and a data payload of the plurality of OFDM symbols for communication between a transmitter and a receiver, **wherein consecutive OFDM symbols use different subsets of tones.**" (emphasis added).

In the present Office Action, Examiner has rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Foerster et al. (US 2004/0047285 A1) and in view of Tewfik et al. (US 2004/0005016 A1). In particular, Examiner relies on the disclosure of Foerster et al. for the limitations of claim 5. Applicants have amended claim 1 to specifically recite differences between the present invention and the impulse-based transmitter of Forester et al. Coded information after the DAC (Figure 2) is used to modulate an impulse waveform. This impulse waveform is designed such that its 10-dB bandwidth is greater than 500 MHz as stated in paragraph [0013]. Therein, Foerster et al. state:

> In the example shown in Fig. 1, six *impulse radio* ultra-wideband (IR-UWB) *waveforms may be generated using an impulse having, for example, a 500 MHz bandwidth* having a

center frequency that may vary between 3 and 6 GHz, although the scope of the invention is not limited in this respect. (emphasis added).

Forester et al. also teach in paragraph [0014] that the bandwidth of the sub-band is inversely proportional to the duration of the impulse waveform. In particular, Foerster et al. state "as the duration of the impulse waveform increases, as the bandwidth of the sub-bands decreases, the transmitted waveform may be continuous in time and may begin to resemble an OFDM waveform." Therefore, the bandwidth of each of the sub-bands $S_i(f)$ in Figure 3 is generated by using an impulse waveform with appropriate duration, typically on the order of a few nanoseconds. Thus, each $S_i(f)$ in Figure 3 is a single tone and not a contiguous bands of tones as required by claim 1.

By way of contrast, the bandwidth of a TFI-OFDM signal is achieved in a preferred embodiment of the present invention by using a 128-point FFT in the sub-banded case, where the tone spacing of the FFT is 4.125 MHz. Data is carried on 122 tones. This preferably includes 100 data sub-carriers, 12 pilot sub-carriers, and 10 guard sub-carriers. Therefore, the bandwidth of the TFI-OFDM signal within a single sub-band is 122*4.125 MHz = 503.25 MHz. Thus, the bandwidth of the signal within a sub-band is created from an IFFT output and NOT by using an impulse waveform. Note that in the case of the TFI-OFDM system, the inverse of the symbol length does not correspond to the bandwidth of the signal (1/312.5 ns = 3.2 MHz). (page 11, line 21 through page 13, line 6). This is very different from the impulse-radio system described by Foerster et al. These features of the present invention are described in detail in paragraphs [0077]-[0082]. Thus, independent claim 1 is patentable 35 U.S.C. § 102(e) over Li et al. Moreover, depending claims 2-4, 6-11, and 23-26 are patentable as depending from patentable claim 1.

Independent claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Lakkis (US Pat. No. 7,031,371 A1) in view of Ramasubramanian et al. (US 2003/0026360 A1). Independent claim 12 recites "time domain data generated by an inverse fast Fourier transform

(IFFT) of frequency domain data; one of a cyclic prefix and a cyclic postfix; and **a guard interval between the time domain data and said one of a cyclic prefix and a cyclic postfix comprising a plurality of zero samples.**" (emphasis added).

Independent claim 15 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Foerster et al. in view of Ramasubramanian et al. Independent claim 15 recites "providing a UWB physical layer operational to generate orthogonal frequency division multiplexed (OFDM) symbols within a desired band; interleaving the OFDM symbols across both time and frequency to divide the desired band into smaller sub-bands; and **inserting a guard interval comprising plural zero samples after each OFDM symbol**, such that the UWB physical layer has sufficient time to switch from its current channel to the next channel." (emphasis added).

Examiner relies on paragraph [0003] of Ramasubramanian for the foregoing emphasized limitations. Therein, Ramasubramanian discloses "a guard interval is inserted between successive symbols to overcome inter-symbol interference (ISI) caused by multipath delay-spread in the communication channel." [0003]. Examiner states "Usually each symbol is cyclically extended with a prefix and/or postfix to cover the guard interval." (OA 10/14/2008, page 8). A guard interval formed from a cyclically extended symbol, however, is not a zero sample guard interval as required by claims 12 and 15. Examiner further states "It is noted that it is well known in the art the guard intervals contain null symbols." However, Examiner fails to cite any reference to support this conclusion. Without a cited source of this conclusion, applicants cannot surmise whether such a hypothetical reference should be properly combined with previously cited references.

Moreover, cyclic extension of a symbol to form a guard interval may compensate for multipath delay-spread, since it is an extension of the symbol itself. However, this is not true of a zero sample guard interval as in the claimed invention. The TFI-OFDM system of the present invention uses both a cyclic prefix as defined above, and also uses a guard interval which is different from either a cyclic prefix or a cyclic postfix. The purpose of the zero sample guard

interval is to allow sufficient time for the transmitter and receiver to switch from one channel to the next. (page 61, lines 19-23). One of ordinary skill in the art with reference to the disclosure of Ramasubramanian would have no reason to insert a zero sample guard interval between sequential symbols as required by claims 12 and 15, since there would be no suggestion to switch between channels. Thus, claims 12 and 15 and their respective depending claims are patentable under 35 U.S.C. § 103(a).

In view of the foregoing, applicants respectfully request reconsideration and allowance of claims 1-4 and 6-35. If the Examiner finds any issue that is unresolved, please call applicants' attorney by dialing the telephone number printed below.

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